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U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

STATE-OF-THE-ART REACTOR CONSEQUENCE ANALYSES

Briefing for Commission Technical Assistants
June 2, 2008

Agenda

- ACRS Recommendation on Level – 3 PRA
- Reporting Latent Cancer Fatalities
- SOARCA Status
- Results to OEDO and Commission
- Communication Plan

Background

- SOARCA Objective: Perform a state-of-the-art, realistic evaluation of severe accident progression, radiological releases and offsite consequences for significant accident sequences.
- Commission SRM
  - Perform consequence analysis for scenarios with radiological release frequency greater than or equal to 1.0E-6 per reactor year
  - Include the potentially risk-significant but lower frequency scenarios; e.g., bypass events (1.0E-7 per reactor year)

ACRS Recommendation

- Level-3 PRAs should be performed for the pilot plants before extending the analyses to other plants. The PRAs should address the impact of mitigative measures (HRA) using realistic evaluations of accident progression and offsite consequences.
- In a meeting with RES senior management:
  - Reduction in consequences reported in SOARCA cannot be convincingly demonstrated to be the result of enhancements to plant design and operation, including SAMGs and B.5.b measures as well as improvements in detailed realistic accident progression and consequence modeling, unless a level-3 PRA is done to benchmark the SOARCA
  - SOARCA will be susceptible to criticisms that important or risk dominant sequences have been left out by using the screening criteria
  - The only way in which it can be convincingly demonstrated that risk important sequences have been considered is to perform a level-3 PRA
  - Use a level-3 PRA to identify high consequence scenarios (that should be included in SOARCA) with a probability of occurrence lower than the SOARCA screening criteria.

Staff Position on ACRS Recommendation

- The staff is unaware of any existing contemporary Level-3 PRA suitable to address the ACRS recommendations, or any previous attempts to include SAMGs, EDMGs, use realistic accident progression, etc.
- The SOARCA screening criteria captured the events which are potentially significant relative to the Commission's safety goals.
- The SOARCA screening process and its frequency criteria are consistent with the regulatory risk significance criteria of RG 1.174.

Staff Position, cont.

- If SOARCA was to include lower frequency events, it is unclear as to how will we address seismic events because no seismic information exist for events below 1.0 E -6/yr.
- The SOARCA analyses consider the containment failure modes which have been demonstrated to be potentially significant to risk (Mark I liner failure, induced steam generator tube rupture, hydrogen combustion, long term containment pressurization and containment bypass initiators).

Staff Position, cont.

- If the NRC were to embark on doing the Level-3 PRA equal in scope to SOARCA, significant resource implications need to be addressed:
  - Potential Cost $3-5 M
  - Duration: 2-3 years
- A licensee that would be willing to undergo months of substantial interaction with the NRC, would need to be identified

Reporting Latent Cancer Fatalities

- SECY 08-0029 Recommendation:
  - LCF expressed as the probability of a population-weighted, average individual dying from cancer conditional on the occurrence of a severe reactor accident
  - Use both LNT and 100 μSv (10 mrem) dose response models
  - Present results for three distances: (1) 0 to 16.1 km (10 miles); (2) 0 to 80.5 km (50 miles); and (3) 0 to 161 km (100 miles)
- Awaiting Commission direction on what dose metric and response model to use

SOARCA Status

- Peach Bottom
  - MACCS reruns with selected metric and dose response model
  - STSBO sensitivity analyses (if SOARCA Steering Committee agrees)
- Surry
  - MACCS reruns with selected metric and dose response model
  - Additional ISLOCA analyses
  - Thermally-Induced SGTR
- Sequoyah
  - Site visit complete
  - Mitigative measures assessment complete
  - MELCOR and MACCS models being developed

Results to OEDO and Commission
(SRM-ML080317B)

- Final results of Peach Bottom and Surry to OEDO: September 2008
  - Need Commission feedback on metric and dose response model by mid-July
- Results to the Commission: October 2008
- Include Communication Plan with the results

Communication Plan

- Revise SOARCA Communication Plan to include:
  - Peer review
  - Dose threshold
  - Metric for results
  - Strategy for releasing the results
  - Strategy for obtaining additional volunteers